General Information Technology

Syllabus

Grade 12

(Effective from 2009)

Department of Information Technology
Faculty of Science and Technology
National Institute of Education
Sri Lanka

1.0 Introduction

General Information Technology (GIT) was first introduced in 2002, based on a decision taken by the Ministry of Education to re-introduce the computer education related subject in Grade 12 (First year of GCE A/L). National level examinations for GIT were held twice in 2005 and 2006. Two unpublished research reports are available to date on the introduction of GIT. In 2006, four years after its introduction, the NIE carried out a survey regarding GIT. The findings of this survey and recommendations of the two said research reports were taken into consideration by the curriculum revision team when revising the existing curriculum.

In re-designing the curriculum, the team seriously considered the following issues:

1. The total time available for GIT is only 60 periods (40 hours)
2. The students who have not followed the Information and Communication Technology (ICT) course at the GCE (O/L) should be considered for GIT
3. GIT should be planned as the common subject to suit the needs of students in different streams of GCE (A/L)
4. GIT should provide the flexibility for the teachers and students to select one of the pre-defined programming languages to enable a move towards a visual programming environment.

2.0 Objectives of the syllabus

This course enables students in Grade 12 to

- select an appropriate ICT course for further studies
- identify relevant computer applications for day-to-day work
- use ICT for day-to-day activities
- interpret events in the day to day world in terms of ICT
- evaluate ICT tools
- appreciate the role of ICT in development
- use ICT tools with due respect to ethical & social norms.

Proposed term-wise breakdown of the syllabus

Term	Competency Level	No. of periods
First term	1.1, 1.2,1.3, 1.4, 1.5, 1.6, 1.7,1.8 2.1, 2.2 3.1, 3.2 10.1, 10.2, 10.3, 10.4	11 02 04 06 (23 periods)
Second term	4.1, 4.2 5.1, 5.2, 5.3 6.1, 6.2 7.1, 7.2, 7.3, 7.4 8.1, 8.2, 8.3, 8.4	04 05 04 04 06 (23 periods)
Third term	9.1, 9.2, 9.3, 9.4, 9.5, 9.6	14

3.0 Syllabus

Competency	Competency level	Subject content	No. of periods
Competency 1 : Explores the computer and its potential to reap timely benefits	1.1 Explores the evolution of computer in terms of its major stages	• Computer Generations o Vacuum Tube o Transistor o Integrated Circuit (LSI, VLSI)	01
	1.2 Uses basic block diagrams to demonstrate the computer system	• Concept of the computer • Data and Information • Components of a computer system and their functions o Input o Processor (ALU, CU) o Memory (RAM) o Output o Secondary Storage • Memory storage types	02
	1.3 Uses number systems to represent data in computer systems	• Number systems o Decimal o Binary o Octal o Hexadecimal	01
	1.4 Converts Decimal numbers to Binary and vice versa	• Relevant methods of conversion o Decimal to Binary o Binary to Decimal	01
	1.5 Draws Truth Tables for logic gates	• Basic Logic Gates(AND,NOT,OR) • Truth Tables	01

Competency	Competency level	Subject content	No. of periods
	1.6 Classifies computers in terms of their characteristics	• Computer classifications o Super/Mainframe/Mini/ Micro (PC, LapTop, Palm Top) o Digital/Analog/Hybrid o General purpose/special purpose o Related changes in characteristics ▪ Size, ▪ Capacity ▪ Speed ▪ Accuracy ▪ Efficiency ▪ Cost	02
	1.7 Selects software to meet user needs	• System Software o Operating Systems o Compilers/interpreters • Application Software o Tailor made (in house) ▪ accounting ▪ library management o Off the shelf (packaged) ▪ office automation ▪ graphics ▪ medical/biological ▪ engineering/ designing (CAD)	02
	1.8 Selects information systems to meet user needs	• Classification of Information systems o Manual/Computerized o According to functionality of system o Different levels of management and use of information	01

Competency	Competency level	Subject content	No. of periods
Competency 2: Uses information communication efficiently and effectively in day-to-day life	2.1 Selects appropriate media for data communication	• Guided media o copper o fiber optic • Unguided media o radio waves o infrared waves o micro waves • Advantages and disadvantages of communication media	01
	2.2 Selects suitable network types as required	• Network Types o Local Area Network (LAN) o Metropolitan Area Network (MAN) o Wide Area Network (WAN) • Devices used in networks o Modem o Router o Network Interface Card o Switch o Hub o Wireless base station • Advantages and disadvantages of computer networks	01
Competency 3: Uses the Internet efficiently and effectively to access and communicate information	3.1 Uses the internet to access relevant information	• Internet and its services • Web browsers • Search information using web address and search engines • Downloading	02

Competency	Competency level	Subject content	No. of periods
	3.2 Uses electronic media for effective communication	• Create an email account • Send & receive e-mail • Instant messaging (Chat)	02
Competency 4: Uses computers efficiently and effectively with awareness of Operating System (OS)	4.1 Investigates the contribution of OS to the functioning of computer	• Purpose of an OS • Examples of OS (Windows, Linux, DOS) • Basic functions of an OS o Providing interface o Disk management o Resource management o Directory and file management o Handling devices like keyboard, mouse	02
	4.2 Uses functions of Operating Systems	• Functions of OS o Directory structure o User accounts o System tools o Control panel	02
Competency 5: Uses Word Processing (WP) software to create various types of documents	5.1 Analyses Integrated Development Environment of WP software to identify its components	• Word processing software o Text editors o Word processors • Word Processing features o Open o Save o Edit o Print • Integrated Development Environment o Tools o Menus o Shortcut key combinations	01

Competency	Competency level	Subject content	No. of periods
	5.2 Creates document and obtains printout using WP software	• Drawing objects • Document formatting • Print enhancements	03
	5.3 Creates tables using WP software	• Tables-insert/delete rows & columns, merge	01
Competency 6: Makes electronic presentations to enhance attractiveness	6.1 Creates slides using basic features of presentation software	• Presentation software • Components of presentation Application Window. o Blank presentation o Layout o Views o Insert a new slide o Insert object o Formatting	02
	6.2 Makes presentations attractive through multi-media features of presentation software	• Customizing animation • Slide transition • Design templates • Rehearse timing	02
Competency 7: Uses Spreadsheet software to solve simple statistical problems and present findings	7.1 Analyses spreadsheet software to identify its basic components	• Spreadsheet software functions (Create/Save/Open/ Close) • Components of Spreadsheets Application Window. • Worksheet, columns, rows and cells • Moving around worksheet • Data entries (text, number, formula, date)	01

Competency	Competency level	Subject content	No. of periods
	7.2 Formats worksheets to meet user requirements	• Formatting Cells o Number o Alignment o Font • Rows and columns- insert • Cells, rows and columns --delete • Worksheet o rename o insert o delete	01
	7.3 Uses mathematical operators and inbuilt functions for calculations	• Simple calculations using values and operators (+, -, *, /) • Simple calculations using cell names and operators • Inbuilt function o Sum o Average o Max o Min o Count o Rank	01
	7.4 Creates charts to make presentations meaningful	• Charts, chart type, chart options • Bar chart, pie chart, scatter diagram and line graph	01
Competency 8: Uses Database Management Systems (DBMS) software to manage information	8.1 Analyses Database Management Systems software to identify its components	• Database Management Systems • Integrated development environment of DBMS software	01

Competency	Competency level	Subject content	No. of periods
	8.2 Creates Tables using DBMS software	• Design view of Tables o Data types - text - number - date/time - currency - yes/no o Primary Key o Field size, Format	02
	8.3 Creates Queries using DBMS software	• Design view of Queries o Filter fields o Filter records o Sort records	02
	8.4 Creates Forms & Reports using DBMS software	• Form wizard • Report wizard	01
Competency 9: Uses selected High-level language effectively to solve simple problems	9.1 Uses flow charts to represent sequence structures determined for problem solving	• Main steps to analyze a problem o Input o Output o Process / Algorithms • Symbols used in flow charts o Start / Stop o Flow line o Input / Output o Process	02
	9.2 Uses flow charts to represent control structures of a design	• Symbols used in flow charts o Condition o Iteration • Selection control structure • Iteration control structure	02

Competency	Competency level	Subject content	No. of periods
	9.3 Uses flow charts to represent integrated control structures	• Symbols used in flow charts o Combinations of the three above	01
	9.4 Identifies codes to represent data types used in high level computer programming languages	• Data types o integer o real o boolean o char o single o double o long • Constant • Variables o Defining variables o Assigning values	03
	9.5 Identifies codes to represent conditional logic used in high level computer languages	• Operators • Input and output statements • Conditional statements o *If* statement / *Case* statement • Repetitive statements o *While* statement	03
	9.6 Uses high level languages to convert flowcharts into computer programs	• Flowcharts and computer programs o Usage of simple mathematical operators o Grading of marks o Solving quadratic equation o Find factorial numbers	03

Competency	Competency level	Subject content	No. of periods
Competency 10 : Uses ICT efficiently and effectively to be successful in life	10.1 Explains the contribution of ICT towards national development	• Education o Learning/Teaching o E-Learning/ Distance Learning o Education Management • Health o Investigation Tools such as MRI scan, CAT scan o Simulations in medical education o Tele-medicine • Agriculture o Linking rural agricultural communities o Communicating with the administration o Meteorological Information o Computer controlled devices • E-Business o Travel and the Environment o Online shopping o ICT in Banking (ATM, Credit card) o On-line Employment • E-Governance o Issuing of identity cards, driving licences and passports o Issuing birth, marriage, death certificates	02
	10.2 Evaluates ICT equipment to select those that meets user needs	• Specifications of ICT devices • Evaluation criteria -cost, quality	01

Competency	Competency level	Subject content	No. of periods
	10.3 Seeks IT career paths to suit one's life	• Standing level of IT qualifications • Various designations related to the IT profession	01
	10.4 Makes optimum use of ICT with awareness on relevant issues	• Ethical o Computer piracy and software theft o Unauthorised access • Social o Digital divide and Digital bridge o Techno-rich employment • Security o Hardware protection o Software protection o Precaution • Health & safety o Affects-eye strain, backaches, uneasiness o Computer habits o Workplace exercise	02

4.0 Learning – Teaching Methodology

In deciding upon the learning-teaching methodology relevant to the course, attention has been paid to the planning of learning-teaching activities so as to facilitate building up of student competencies based on exploration. In preparing for competency-based education, in this manner, an obvious change in the role of the teacher is expected.

The transmission role practiced in our classroom from way back and the more recently introduced transaction role are evident in the classroom even in the present day. When taking the deterioration of the thinking skills, personal skills and social skills of school leavers into consideration, it needs no effort to understand that there is a need for the development of the learning-teaching methodology and some conception on how it should be effected.

In the transmission role while the teacher is considered an individual who knows everything, the task has become that of considering the student as one who does not know anything and of transmitting knowledge to him/her. This learning-teaching process that takes the guise of lectures is restricted only to the flow of knowledge from the teacher to the student, does not make an adequate contribution either to the stimulation of student thinking or to the development of his/her personal and social skills.

The dialogue initiated by teachers within the class is the initial stage of the transaction role plus the ideas that flow from the teacher to the class and from the class to the teacher. These dialogues get gradually transformed into discussions as a result of the student-student interaction that takes place subsequently. The teacher is continuously involved in the task of questioning in order to take in student from the known to the unknown, from the simple to the complex and from the concrete to the abstract.

While, in competency-based education, student tasks occupy a powerful position, the teacher occupies the position of a resource person who mediates in order to provide every student in the class with at least the competency proximate to each relevant competency. For this purpose, the basic functions the teacher is expected to perform include planning of a learning environment consisting of the materials and other facilities necessary for learning, close observation of how students learn, identification of student abilities and inabilities and the promotion of student learning through feedback and provision of feed-forward as well as the preparation of instruments of assessment for the extension of learning beyond the classroom. The teacher's role, based eventually upon the tasks above, is called the transformation role.

The series of activities that can be used in the implementation of the descriptive curriculum introduced in the first part of this course guide has been included in its second part. Each of these activities has been developed to contain a minimum of three steps.

It is expected to get the student involved in the learning process through the first step of the activities. As such, this step is called the "Engagement" step. As an introduction to this step, the teacher assumes the Transaction role and engages in a dialogue with the students. Later, along with the transformation of this dialogue to a discussion, the students engage in exploration and are provided the opportunity to recall the pre-knowledge related to the basic competency they should develop and to acquire a clue regarding the future of the activity. The teacher possesses a host of strategies that can be used in these exchanges of ideas. Some of the devices at the disposal of the teacher for the exchange of these ideas are questioning/stimulants like pictures, newspaper advertisements and flash cards/use of puzzles or case studies/dialogues, role play, poems, songs and demonstrations, video tapes or audio tapes. In summary, the first step of the activities is implemented with the objective of actualizing the three objectives below.

- Winning over of the attention of the class.
- Providing the students with the opportunity for their recall of the necessary pre-knowledge.
- Introducing the elements of the explanation the students are expected to be directed to under the second step of the activity.

It is with the objective of providing the students with the opportunity of Exploration that the second step of the activity has been planned. Students base their exploration on a special leaflet prepared for the purpose. The teacher has to plan this explanation to enable the students to engage in co-operative learning through the exploration of various aspects of the problem, in groups. Some of the most important qualities of this step are involvement in the meaningful group discussion and the use of the resource materials provided. As a result of involvement in group activities through a long period of time, student will acquire the ability to develop a number of skills like self-

discipline, listening to others, working co-operatively with others, helping them, management of time, effecting creations of high quality, honesty etc. In directing students to exploration, while the teacher should avoid taking decisions regarding leadership, he should build up the background necessary for leaders to surface. Accordingly, the students will have the privilege of taking on leadership when opportune, based on hidden abilities.

During the third step of the activity, every group will get the opportunity of presenting the results of its exploration for the enlightenment of the others. What the teacher has to do here is to encourage students to make group presentations. It would be effective if students are directed in order to ensure that every member is given responsibility in planning different parts for the presentation. An important quality of this step, related to the explanation of student findings, is the creation of the opportunity for the voice of students to be heard in the classroom where, mostly the voice of the teacher had dominated.

After the explanation of the findings in the third step of the activities, students should be directed to elaboration. Each group is given the opportunity to provide constructive suggestions on its findings first, and subsequently, members of other groups are given this opportunity. Anyway the final review is the responsibility of the teacher. The teacher is expected to touch on all the important points relevant to the students' exploration.

The main responsibility of the teacher in this learning teaching process is to monitor continuously, whether the classroom learning-teaching process is implemented as effectively, as expected. While assessment and evaluation should be made use of for this purpose, the teacher is provided the opportunity, through planned activities, in the learning teaching process itself. The teacher is given the opportunity for assessment while the students are involved in exploration during the second stage of the activity and for evaluation when the students are involved in explanation and expansion during the third stage.

The teacher is provided directions on the transformation role by the learning–teaching methodology described so far. While priority is given to group exploration here, the teacher is also afforded the opportunity for transaction, discussion and short lectures. While there is room for transaction and discussion, the teacher may also give a short lecture in the final stage. In the development of the learning-teaching methodology related to this curriculum, the first to be introduced under the curriculum reforms for the new millennium, the attention paid to the important features relevant to the transmission as well as the transaction roles of the teacher, as part of the transformation role, is a special feature of this methodology.

The learning-teaching process can be broadened through the improvement of the evaluation program. For this purpose the teacher has the opportunity of creating several evaluation situations through a series of activities. The program of assessment can be made meaningful by dividing the activity continuum to several activity clusters to facilitate identification of evaluation points. It is necessary that the evaluation instrument being used with respect to each activity is introduced to the students at the beginning of every activity cluster. It is also necessary in the selection of learning varieties, that are those activities where student motivation to learn are helped to blossom forth, selected.

Below is a list of the relevant activities:

Concept maps	Panel discussions
Wall newspapers	Seminars
Quizzes	Impromptu speeches
Question and answer books	Role-play
Portfolios	Presentation of literature reviews
Exhibitions	Field books/ nature diaries
Debates	Practical tests

5.0 School Policies and Programmes

The schools attempting to implement GIT at the grade 12 are likely to face a number of challenges. First and foremost, the non-availability of a computer laboratory or an adequate number of computers for the task will not allow all schools with GCE (AL) classes to initiate this course. The technical nature of IT will further limit the number of teachers opting to teach the subject thereby preventing the school authorities from selecting the most suitable teacher to be trained for the purpose. Moreover, lack of senior teachers, both within and in, the vicinity of the school will not allow adequate assistance and guidance to be offered to those teachers who undertake teaching of the subject.

Curricula proposed under the first curriculum reform of the new millennium require all subject teachers to introduce the philosophy of learning by doing. The teachers attempting to meet this requirement have to link theory with practice in every activity they plan for their students. The learning thus acquired through activities has to be supplemented with a number of additional practice sessions. All this requires every school offering the subject to be equipped with a computer laboratory with multimedia facilities. Although the ideal situation in this respect is to provide a computer to each student, the many limitations resulting through resource constraints would necessitate two students to share one computer.

It is also important that each school has a technician or at least a competent teacher to attend to minor repairs and breakdowns and troubleshoot software. The school authorities, however, are encouraged to get the major repairs attended to by the Computer Resource Centre (CRC) in the region or by the computer vendor itself in the availability of a valid warranty. Maintenance and repairs to computer items thus will ensure the availability of a running computer laboratory for continuous use by students throughout the course period.

All teachers selected for teaching of GIT must have skills over and above mere computer users. Such teachers should be able to understand the logic of programming. They should further have the capacity and willingness to update the competencies they acquire originally to be in line with the new developments of the industry. In view of facilitating this, the teachers selected should be exposed to both initial and continuing teacher education programmes organized for them by the IT Department of the Science and Technology Faculty of the National Institute of Education.

GIT is taught in grade 12 through two periods per week. The teachers will have to study the activities given in the Teacher Instructional Manual (TIM) in dividing the time assigned between activity and practice sessions. Since the computer laboratory available to each school is shared for Computer Assisted Learning (CAL), ICT (G.C.E O/L), and various other programmes on computer awareness, it is advisable to maintain a time allocation chart in the computer laboratory itself to prevent any possible clashes.

The tools developed to extend learning and teaching can be used for assessment and evaluation as well. The resulting marks can be submitted to the Sri Lanka Department of Examinations for certification purposes.

Until the full cadre of In-Service Advisors (ISAs) are appointed to support teachers at school level, the schools are expected to maintain a close relationship with the closest CRC and the Provincial Centre for IT for purposes of monitoring the progress of the subject and provision of necessary feedback to the teachers. The relevant sectional head and the senior teachers of the school also may assist the GIT teacher on pedagogical matters to enable joyful learning for the students. All parties responsible for ICT education also will be updated from time to time on such matters.

For successful implementation of GIT at school level, the schools should demonstrate a culture conducive to ICT. School administrative and instructional processes embracing ICT for day-to-day activities are two features of such a culture. It is also important for the majority of students of the school to have some exposure to ICT and the school community to value ICT education as a tool for future employability. To accomplish the first task here, the schools are encouraged to form ICT clubs, conduct ICT exhibitions, and make visits to ICT organizations. Links with relevant industries in the locality will pave the way for the latter. Support extended by such institutions in developing the ICT sections of the schools and in supplying employment to school leavers will enable the schools to make ICT popular among their school communities.

6.0 Assessment and Evaluation

It is intended to implement this syllabus in schools with the School Based Assessment (SBA) process. Teachers will prepare creative teaching-learning instruments on the basis of school terms.

The first examination under this syllabus will be held in 2010.

The details together with the format and the nature of questions will be introduced by the Department of Examinations.